

*Tap into
Learning*

Spigot

Science Magazine
for Kids and Classrooms ®

Bugs

Check out our website:

<http://www.spigotsciencemag.com>

Books, Links, Teaching Guide

In this Issue:

*Bugs or Insects? *Here Come the Army Ants
*Bug Stamps *Bug Society Play *and much more!

Our Mission

The mission of Spigot Science Magazine is to help children understand how and why the world works and to inspire young minds to be curious and thoughtful stewards of the world that will be theirs one day.

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From the Publishers

Dear Readers,

Sometimes it seems that bugs are all over the place. This past year, through all the seasons, we had stinkbugs living both indoors and outdoors. A few years ago we were inundated with ladybugs. Are these guests bugs or insects? See *Bugs or Insects*, p.4. And then there are the nomadic army ants that actually form a bivouac, a big ball of ants, to live in. Fortunately, they prefer the rain forests of Central and South America. See *Here Come the Army Ants*, p.7.

With all these bugs around, it makes perfect sense to start a bug collection. In *Think Like a Scientist*, p.10, ichthyologist John F. Kuhns tells us how to go about starting a bug collection, what materials we need, and how to display our specimens. He talks about the importance of observing and journaling as we collect. Charles Darwin, a most influential natural historian, filled at least 25 notebooks with his observations and drawings, as he sailed around the world, 1831-1836, studying and collecting bugs, plants and animals. He changed the world of biology, *Scientists Are People Too*, p.21.

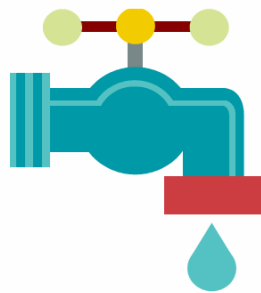
What would bugs talk about if they gathered in the Okefenokee Swamp for a bug talk? Find out, and be a bug in the play, *The International Bug Society Convention*, p.15. Then learn about a real bug mystery: *Where Are the Bees?* p.19.

Does all this bug talk really bug you? We just hope your computer doesn't get a bug in it so you can enjoy the Bugs issue of Spigot.

Pondering,
Valeria Girandola, Publisher and Editor-in-Chief
David Cochran, Publisher and Chief Learning Officer

About the Cover

The ladybug on the cover was drawn by Everaldo Coelho as part of the Crystal Project. It is on Wikipedia Commons.



Bugs

Connections Across the Curriculum

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Look for **BOLD** words throughout Spigot. These are vocabulary words you should learn. If you don't know them, look them up online or in a dictionary.

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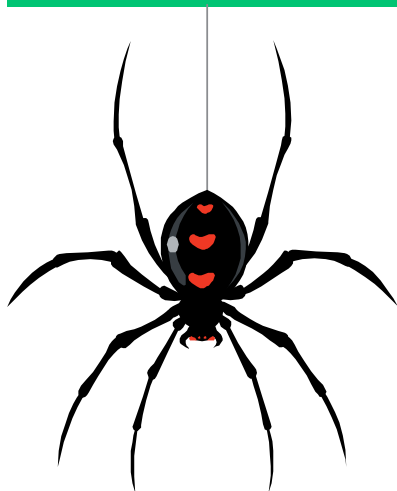
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When you see a picture of Ponder in Spigot, you'll know it's time to think or try something.



Bugs or Insects?

What's the
difference?

All insects are bugs,
but not all bugs are insects!

They seem to be everywhere – creeping and crawling and flying around. Sometimes we call them bugs and sometimes we call them insects. But how do we know the difference between bugs and insects?

Bug is a general term referring to several **classifications** of animals. (Yes, insects and bugs are animals.) They belong to a class called **Arthropods**. The word *bug* is not a scientific classification. It's more like a nickname given to some Arthropods.

There are four classes within Arthropods as shown in the table below. We often refer to three of the classes as bugs. We seldom call **Crustacea** bugs. Somehow a shrimp or lobster doesn't seem like a bug!

Classes of Arthropods	Example of members
Crustacea	Shrimp, barnacles
Myriapoda	Centipedes, millipedes
Arachnida	Spiders, ticks
Insecta	Crickets, bees



Ant

These classifications help us divide the members of the animal kingdom into groups so we can see how they are alike and different. It helps us make sense of the many animals in our world.

Insects have their own classification called **Insecta**. These animals have three parts to their bodies – head, thorax, and abdomen. They also have three pairs of legs and a pair of antennae. Sometimes they have wings. Notice these parts on the picture of the ant.



Tarantula

The other classes that we call bugs are different from insects. **Arachnida** have two parts to their body – a **cephalothorax** (a head and **thorax** combined) and an **abdomen**. They have four pairs of legs, no **antennae** and no wings. You'll never see a flying arachnida. Notice these parts on the picture of the **tarantula**.



Centipede

The third class of arthropods that we call bugs is **Myriapoda**. These bugs have a head and a trunk. They have many pairs of legs, one pair of antennae and no wings. Notice these parts on the picture of the **centipede**.

Now that you know the difference between the three classes of bugs, you can identify them when you see them and begin to think like a scientist as you make sense of our world filled with bugs.

Activity

1. Go to <http://www.kendall-bioresearch.co.uk/class.htm#insecta> to learn a lot more about insects and other arthropods. Use the information on this site to tell which class of arthropods each the following bugs is in – myriapoda, arachnida, or insecta. When you go to the site, click on the link next to the name of the arthropod and you will see pictures. Use the pictures and descriptions to tell why the bug is in the class you chose.

Arthropod	Class
beetle	
centipede	
scorpion	
termite	
millipede	
tick	
butterfly	

Answers on page 27

2. Discussion: What does the quote in the box at the beginning of the article mean? Explain why it is true.

Spit, Goo, and Honey Pots

By Sandie Lee

Spit, goo, and honey pots. Is this some kind of weird recipe? Or perhaps, the answer to some silly joke? Not quite. These are Mother Nature's ways of giving bugs the means to protect themselves.

Spit Protection

The Frog Hopper larva spits to protect itself. The bubbly froth is known as "cuckoo-spit" or "snake-spit." This happens when the **larvae**, the immature form of a bug, blows air into a liquid from its rear end. This foamy froth keeps the larvae from drying out. It also hides them from the eyes of **predators**, and tastes pretty bad if bitten into. Predators think twice before taking a bite. Look for it on plant stems.

Bombs Away!



Frog hopper

Yerpo, Wikipedia

The termite's worst enemy is the ant. To stop ants from attacking, some termites are protected by exploding soldiers. These guys swell up and burst open to stop an invasion. And it works! The sticky, slimy goo covers the enemy ants, stopping them in their tracks. Other termites have a special jaw. They just pick up the attacking ant and flick it into the air.



Soldier termites

L. Shyamal, Wikipedia

A Tasty Snack?

Honey pot ants feed on nectar. But what do they do in the dry season when there is no **nectar** available? They go to their living warehouses, also known as **repletes** (re-pleets). Repletes are special ants that are constantly fed by the worker ants. Repletes get so big they almost burst. But before this happens, the hungry ants will feed from them. So nobody goes hungry. In fact, aboriginal tribes in Australia will raid these nests in search of honey pot ants. They pop these tasty ants into their mouths for a sweet treat.



Honey pot ants

Greg Hume, Wikipedia

Sandie Lee lives in Ontario, Canada, with her husband and three feline-friends along with a host of outdoor, feathered and furry visitors. Check out some of her work at: <http://imagination-cafe.com>

Activity

Go to <http://www.enchantedlearning.com/subjects/butterfly/allabout/Defense.shtml>. Read about the ways caterpillars and butterflies protect themselves. Pick one of the ways that you like. Write a scene showing what happens when a caterpillar or butterfly meets an enemy. Tell how it protects itself.



Classification:

Keeping Bugs Organized

A **species** is a group of individuals that look alike, act alike and produce similar offspring. We human beings, *Homo sapiens*, are only one of 10 million different species that are classified and described by scientists. This is called the **taxonomy**, or classification, of species. There are seven main parts to each classification: Kingdom, Phylum, Class, Order, Family, Genus, and Species.

Human being are classified as *Homo sapiens*, using the last two groups of the classification:

Kingdom – Animalia - (animal)

Phylum – Chordata - (with backbone)

Class – Mammalia - (nurses its young)

Order – Primates - (has nails and opposable thumbs)

Family – Hominidae - (humans, great apes, and their extinct relatives)

Genus – Homo - (modern humans and their close extinct relatives)

Species – sapiens - (“wise or knowing” man)

The common honeybee is classified as *Apis mellifera*.

Kingdom – Animalia - (animal)

Phylum – Arthropoda - (jointed foot)

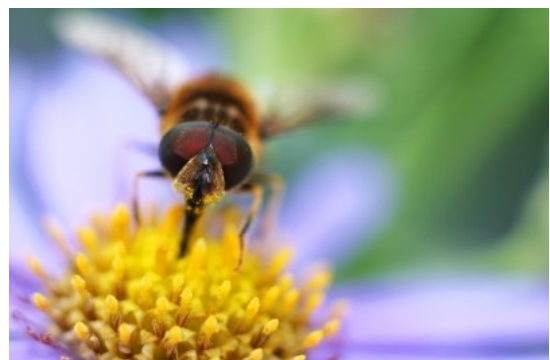
Class – Insecta - (three body parts, six legs)

Order – Hymenoptera - (wings and antenna)

Family – Apidae - (long tongue)

Genus – Apis - (bee)

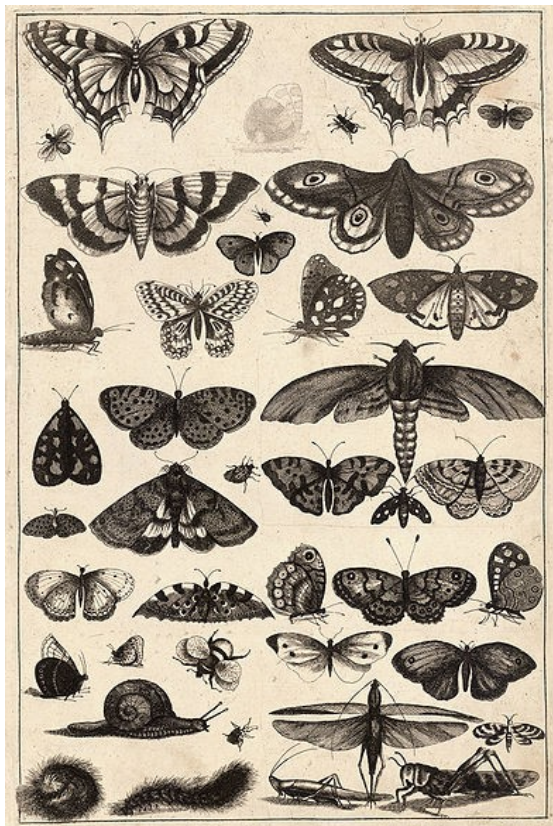
Species – mellifera - (honey making)



freedigitalphotos.com

Over two hundred years ago, in 1753, Carolus Linnaeus, a Swedish scientist, invented this classification system. It divides things into groups making plants and animals easier to observe, identify, and study. Each animal and plant is given two Latin names that identify it. This is like your first name and your last name. The first name is the genus, a general group, and is capitalized. The second name is a species, or a specific group, and it is not capitalized. Both words are italicized. Scientists estimate that there are millions more living things as yet unknown and unclassified. A fun mnemonic device to remember the seven groups is:

Kings Play Chess On Fat Green Stools.



Wenzel Hollar, Wikipedia Commons

Classification of butterflies

Activities

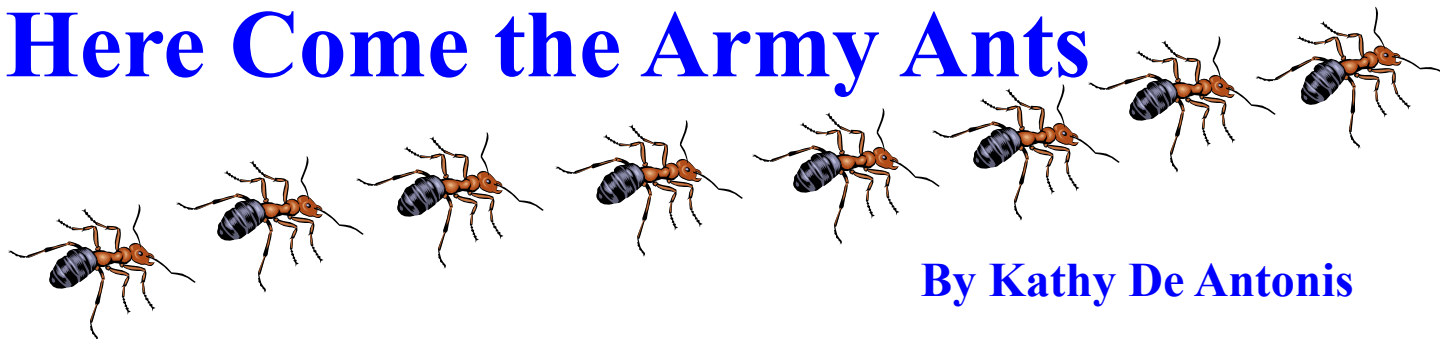
1. Choose one bug and one plant. Search for their classification. Use the words *taxonomy* and *classification* in your search. See if you can find all seven group names.

See if you can find another animal or plant that has the same classification as the ones you picked.

2. Make up an imaginary animal. Describe it, then write its classification.

* Ladybugs above: *Ladybirds, Salvatore Vuono, freedigitalphotos.net*

Here Come the Army Ants



By Kathy De Antonis



Mehmet Karatay, Wikipedia

The army ants form a tunnel so the soldiers can go into battle with their prey.

Shhh! Listen and watch as the forest floor comes alive with activity. Insects and small animals are flushed from the safety of their secure hiding places and are on the run. They are **frantically** trying to escape, but from what? The army ants are coming!

Army ants are an unusual species of **carnivorous** ants that live in the rain forests and dry forests of Central and South America. They look a lot like ants

that can be found in backyards everywhere, but don't be fooled. These ants are **ferocious**, and the wildlife that lives near them knows it!

Ants Look Alike

Army ants look a lot like any other ants. Their colors range from reddish-brown to brown. They are about one centimeter (cm) long and their bodies are covered with a strong **exoskeleton** which acts like a suit of armor for protection. Like all ants, their bodies are divided into three sections, the **head**, **thorax** and **abdomen**. Extending out from the front of the ant's head section are two **antennae** which give the ants the senses of touch, taste, and smell. Below the antennae is the mouth that has two jaws called **mandibles** which are like razor sharp pinchers. Army ants are practically blind. Rather than relying on vision to see where they are going, army ants move around by following the scent of ants around them.

The middle body section, called the thorax, has six legs. The abdomen section of the ant contains two stomachs. As the ants swallow their prey, some food is digested in the **main stomach** and some of the food is stored in the second stomach, or **crop**, for the ants back in the nest. When the ants return to the nest after hunting, they empty their crop for the other army ants to eat! Yuck!

Large Colonies of Carnivores

Army ants, unlike ordinary ants, live in huge colonies with as many as 1,000,000 others.

They are carnivorous which means that they are flesh eaters. They don't eat plants. Hundreds of thousands of army ants leave the nest at dawn each morning on a **mission** — to gather as much food as they can to feed the colony. They travel in a long trail. If you watch the trail from above, the ants look like they are travelling a two-way ant super highway at rush hour!

(Continued on next page)

Science Connection

(Here Come the Army Ants ,continued)

Because they hunt in such massive numbers, they are able to work together to kill prey that is much larger than they are. Not only do they attack insects, they also attack small animals like mice, lizards, scorpions, frogs, snakes, and even birds. They overtake these creatures using their razor sharp mandibles to slice and tear the tissue of their prey. They will kill as many as 10,000 creatures in a single day. Fortunately, they do not attack people!

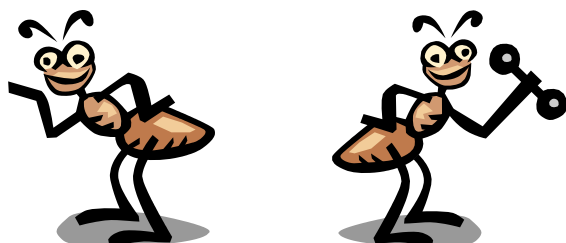
Unlike ordinary ants, army ants are **nomadic**, which means that they move the nest from place to place. As they hunt, they deplete the food supply in an area, so they move to another place where the food will be more plentiful. The army ant nest is called a **bivouac**, and it is not like ordinary ant nests that are usually dug into the ground or the hollow of a tree. A bivouac is very portable because it is simply a big ball of ants. The army ants cling together using the claws on their legs and their mandibles. They hold each other and link together. They protect the queen and her eggs deep inside the nest, and there are tunnels inside for the ants to move around.

Army ants are **unique** and even a little bit scary. The next time you are enjoying a summer picnic and some pesky ants disturb your meal, remember it could be much worse. They could be army ants!

Kathy De Antonis is a science writer who lives in Old Saybrook, Connecticut.

Activities

1. Make a chart comparing the ordinary ant to the army ant. For example, what kind of nest does each type of ant have? Do they eat the same things?
2. Draw or find a picture of an ant. Label its parts using information from this article. Tell in your own words what each part of the ant does.
3. Go to: <http://animals.howstuffworks.com/insects/ant-info3.htm>. Read about the different roles that ants take in their colonies. Make up a story using the different ants in different roles to show what life is like in a ant colony.



Watch Out , Star!



V. Girandola

Star closely observes a wasp's nest that had dropped from the tree branch above. There could be hundreds or thousands of wasps inside! Wasps make their nest by scraping wood fiber from weathered wooden fences and telephone poles with their mouths. They make what looks like paper by mixing the fiber with their saliva and chewing it to make it soft, moist and pasty. Then they spread this paste with their mouths to make the nest structure .

Is It a Wasp or a Bee?



*Jon Sullivan
Wikipedia Commons*

*Alvesgaspar
Wikipedia Commons*

Have you ever wondered if that insect that goes around stinging is a bee or a wasp? You're not alone. Both bees and wasps belong to the same insect classification, but they don't look alike or eat the same things.

Go to: <http://insects.about.com/od/identifyaninsect/a/beeorwasp.htm> . Read the information and look closely at the chart. In your own words, tell the difference between a bee and a wasp. After you decide which is the wasp and bee in the pictures above, check on page 27 to find out if you are right.

What Good Are Pesky Bugs?



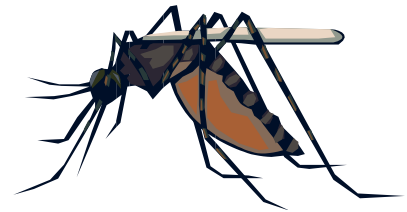
Bugs can affect us in many different ways depending on where we live and the time of the year.

Even in colder climates like Alaska, bugs can be a problem. Steve Kroschel of the Kroschel Wildlife Centre in Haines, Alaska, reports that the hungry black flies arrive in late spring. They love to suck human blood, and their sting hurts more than a mosquito bite. The **caribou** in the Arctic National Wildlife Refuge are so bothered by mosquitoes that they **migrate** east toward Canada in large herds to get away from them.

In late May, the big female mosquitoes that survived the winter lay eggs in the wetlands. When the eggs hatch, the mosquitoes swarm in clouds, invading everywhere. "They are also clever in squeezing between the logs in the log cabin, or reminding you if the doors are not shut tight or the window is open," Kroschel said.

A type of tiny aphid called "No-See-Ums" also like to bite, and they affect many animals from mice to moose. These small bugs cause big animals like caribou to stop, shake, and roll all day long.

Pesky bugs aren't all bad. They serve a purpose, too. Other animals love to eat them, so they provide the food needed for the birds, spiders and others to survive. They are an important part of the food chain for some, but pests for others.



Activities

1. Bugs Near You

Think about where you live and the kinds of bugs you see at different times of the year. Talk with other students and compare notes. Use the Internet or books to find the correct names of these bugs and learn facts about them. Make a bug calendar that shows which bugs occur in which months of the year in your area.

2. Pesticides

One of the ways that humans deal with pesky bugs is to use insecticides or pesticides. These are chemicals that kill the bugs. Using books or the Internet, find some common pesticides that kill common bugs like ants or spiders. See if there are any side effects of using these chemicals. See also if there are some other ways to get rid of these bugs without using pesticides. Discuss your findings with others.

Ponder

What would happen if a bug's natural enemy, the creature that eats it, suddenly disappeared? How would it affect other animals and humans?



Burt: I saw an army ant the other day.

Axel: Oh yeah? Was she with an army uncle?

~ ~ ~

Seymour: What do you call a fly with no wings?

Miria: I don't know.

Seymour: A walk!

~ ~ ~

Bob Spider: I got a B in science.

Alice Centipede: Me, too.

Bob Spider: I heard she only gives bees A's.



Think Like a Scientist

*Have you ever thought about how you think? Have you ever wondered how we can look at something that's confusing and make sense out of it? Scientists do this all the time. Learning how scientists think can help us become better thinkers. The scientific inquiry process is an important part of discovering and learning how the world works. When reading Spigot, look for opportunities to **Think Like a Scientist**.*

Zoology is the branch of biology that involves the scientific study of animals and all aspects of animal life. **Entomology** is the branch of zoology that deals with the study of insects. Bug collecting is the beginning of becoming an **entomologist**. Bug collecting is also a fun and informative way of getting to know a lot about the world around you. You can start in your own back yard, in the park, on the playground, in fields, at the seashore or even in your own home.

As a caution, it is important to know which bugs could harm you—some spiders, ticks, and bees, to begin with. Always wear gloves! Here are important bug collecting suggestions from scientist John F. Kuhns, a practicing chemist, **ichthyologist**, **paleontologist** and inventor. For a more in-depth discussion see “An Interview with John Farrell Kuhns on Bug Collecting” at

<http://www.spigotsciencemag.com/bugs>

How to Start Collecting Bugs

1. Have an interest in entomology. Fortify that interest by reading about different bug species and their **ecology**—where and how they make their living.
2. Have the proper collecting tools:
 - Sturdy collecting net
 - Tweezers,
 - Magnifying glass
 - A set of vials to hold specimens
 - Journal and pen
 - Gloves
 - Digital camera
 - Self-sticking labels
 - Bug-repellant for chiggers and ticks

3. Prepare a killing jar with some **ethyl acetate** on a sponge of cotton batting on the bottom. Putting the bugs in the jar will put them to sleep and then painlessly kill them.
4. Use “Japanned” steel pins, insect display boxes, and labels to preserve the collected bugs.
5. Make detailed observations in a journal or on your computer. Record everything: where, when, and how each bug is collected.
6. Identify and label each bug using an insect field guide.

Once started, you can add a collection from any place that you visit. And you'll be thinking like a scientist—an entomologist.

John Farrell Kuhns is the proprietor of H.M.S. Beagle, The Ultimate Science Store, Parkville, Missouri. <http://www.hms-beagle.com/>



Wikipedia

Beetle collection at the Melbourne Museum, Australia

Bug Stamps Around the World



Canada

bugsonstamps.com

Almost every country in the world has a postal system for delivering its mail. They also produce stamps that represent important things in their lives. People all over the world like to collect the stamps that various countries produce. It's fun, and it helps collectors learn about other cultures.

Stamp collectors are called **philatelists** and the agencies in countries that sell stamps to collectors are called **philatelic** agencies.

Philatelics is divided into many **categories**, and people often just collect certain categories. There is a whole category about bugs on stamps, and almost every country has stamps with pictures of their native bugs on them.

Here are some stamps from around the world:



Panama

bugsonstamps.com



Republic of China

bugsonstamps.com



Poland

bugsonstamps.com



bugsonstamps.com



India

bugsonstamps.com



bugsonstamps.com

Activity

Got to

http://bugsonstamps.com/country_master.htm.

Explore the bug stamps of various countries. Find the countries on a world map.

Tracing Darwin's Journey



Charles Darwin spent five years traveling around the world learning about different types of plants and animals. As noted in the article, *Scientists Are People Too*, on page 21, Darwin sailed on the HMS Beagle in 1831 and returned in 1836. He kept notebooks full of new information about the plants and animals he found along the way.

You can trace Charles Darwin's journey around the world by using a world map. You may need an atlas or a wall map because you need to be able to read the names of places. Start in England and find each place he stopped. You can find free maps to download and trace Darwin's journey on the Internet at: <http://www.eduplace.com/ss/maps/world.html>. If you really want a research challenge, go to the Internet or the library to find out what he found at each stop.

1. December 27, 1831 – Darwin leaves Plymouth, England, aboard HMS Beagle.
2. Passes through the Madeira Islands and the Canary Islands
3. Visits the Island of Santiago in the Cape Verde Islands (first curious discovery)
4. Sailed toward Brazil, crossed the equator
5. Salvador, Brazil (beautiful beyond his wildest dreams)
6. Rio de Janeiro, Brazil (collected specimens of plants and animals)
7. Montevideo, Uruguay
8. Patagonia (collected fossils of armadillo shell, ground sloths and giant teeth)
9. Around Cape Horn to Pacific Ocean (delayed by violent storms)
10. Chiloe Island, Chile
11. Valparaiso, Chile (explored in the Andes Mountains)
12. Lima, Peru
13. Galapagos Archipelago (rode on the back of giant tortoises)
14. Tahiti, 3,200 miles into the Pacific from the Galapagos Islands
15. New Zealand
16. Sydney Cove, Australia (thought that a separate act of creation must have made the odd-looking platypus)
17. Tasmania
18. Keeling Island in the Indian Ocean
19. Mauritius Island
20. Cape Town at the tip of South Africa
21. St Helena Island (where Napoleon is buried)
22. North to Ascension Island
23. Detour over to Bahia de los Santos, South America
24. North over the equator to the Cape Verde Archipelago
25. The Azores
26. Falmouth England, October 2, 1836, after a voyage of 4 years, nine months, five days

Beetle Activity

In the Insecta class there are 29 different orders of insects. Beetles (of the order Coleoptera) are the largest order in the whole animal kingdom with more than 35,000 known species. You probably know and love the cute beetle, the ladybug! Visit <http://www.kendalluk.com/bugindx.htm> to find out which other insects, bugs and beetles you know.



Wikipedia
Stag beetle

Earth's Largest Bugs

Giant Dragonflies

By Laurie Bayramian



A fossil of a meganeura

Ghedoghedo, Wikipedia

Dragonflies are quick, light, and pretty bugs. They zip through the air, snatching mosquitoes and flies in the blink of an eye. It is hard to imagine these tiny creatures are related to the biggest bugs that ever lived.

300 Million Years Old

Three hundred million years ago, giant dragonflies ruled the skies. These **prehistoric** dragonflies were huge. The largest had wings 28 inches wide, a body 17 inches long, and weighed 1 pound. The largest butterfly in the world today has a wingspan of only 12 inches—less than half the size!

Fossils of prehistoric dragonflies were found over 100 years ago. The largest dragonfly species ever found was named *Meganeuropsis*. The name means “large veined”, referring to the large **veins** in dragonfly wings.

Scientists were **baffled** by their large size. After all, bugs are not usually this big, and for a good reason. Smaller bugs can hide better from **predators** and fly faster. Modern dragonflies are very fast and **agile**, flying around 35 mph. They are called “mosquito hawks” for their awesome ability to catch **prey**. Prehistoric dragonflies would have been much slower in the air, more like a big commercial jet rather than a swift fighter plane.

Why So Large?

So why did prehistoric dragonflies get so huge? Scientists think the Earth’s climate 300 million years ago is the key to solving this mystery. The Earth was warm and humid, much like today’s tropics. The tropical conditions were perfect for early plants, like ferns and club mosses, to grow fast.

Thick forests covered the land, releasing more and more oxygen into the Earth’s atmosphere. The oxygen levels reached 35 percent, much greater than today’s level of 21 percent. Bugs could get oxygen into their bodies more easily and grow bigger.

The giant dragonfly wasn’t the only large bug found during this period. Others include a 6-inch cockroach, a grasshopper-like insect with a 14-inch wingspan, a 6 -foot long millipede, and a 7-foot long giant sea scorpion.

Meganeuropsis probably hunted in the swamps for mayflies, cockroaches, and small amphibians to eat. As time went by, the Earth’s climate grew colder and drier, with less oxygen. Giant dragonflies died out around 250 million years ago, but their smaller relatives still remain.

Activities

1. Would a prehistoric dragonfly fit through a doorway? Measure the width of a doorway to find out.
2. Calculate the percent increase in oxygen during the Carboniferous Period compared to today’s levels.
3. The world’s biggest dragonfly today has a wingspan of 7 inches and the smallest dragonfly has a wingspan of .8 inches. Calculate how much smaller these insects are compared to *Meganeuropsis* as a percentage.
4. Draw a picture or make a life size model of *Meganeuropsis* using the picture at <http://www.windsofkansas.com/lifesize.html> as a reference.

BUG MAXIMS



A maxim is a saying that expresses truth or wisdom. Here are some maxims about bugs.

Maxim 1

He who lies down with dogs gets up with fleas.



Maxim 2

It's easier to catch flies with honey than with vinegar.



Maxim 3

Even caterpillars could fly, if they would just lighten up.



Maxim 4

Bees that have honey in their mouth have stings in their tails.



Discussion

1. Pick one of the bug maxims and tell in your own words what it means.
2. Share your meaning with others and see if they agree or disagree. Why do they feel this way?
3. Has one of these maxims ever applied to you or someone you know?
4. Many maxims use bugs to make their point. Why?

Spigot Theater

The International Bug Society Convention

By David Cochran

Characters:

Narrator
Maddy – a Madagascar Hissing Cockroach
Tranch – a Tarantula
Snow – a Snow Flea from Alaska
Monty – a Monarch Butterfly
Soldier – a Soldier Beetle
Antsy – an Ant
Gypsy – a Gypsy Moth

Setting:

Okefenokee Swamp on the Georgia/Florida border

Actors should research the bug role they are playing. Each bug should have at least one identifying color, body part, or prop as a costume.

NARRATOR

(Characters enter as the narrator speaks.)

We are at the International Bug Society Convention deep in the Okefenokee Swamp, a 700-square-mile swamp in Georgia and Florida. It is the largest swamp in North America.

In the background, curious orb-weaving golden-silk spiders hang in their webs from the swamp plants. The spiders are watching the strange bugs who have come to their swamp from all over the world.

It is the opening session of the convention and the bug members are seated on the swampy ground. Their new president, Maddy, a Madagascar Hissing Cockroach, is standing before them.

MADDY

Welcome to our annual convention, my creepy, crawly invertebrate friends.

ALL

Hola. Hi. Bonjourno. Hey, baby.

MADDY (Hissing)

Who said Hey baby? Don't be disrespectful, you hear?

TRANCH

You must have traveled a long way, Maddy. All the way from Madagascar, wherever that is.

(Continued on next page)

Language Arts Connection

(The International Bug Society Convention, continued)

MADDY

Not really, Tranch. I escaped from a pet store in Orlando last week.

ALL (They all laugh.)

MADDY

So I thought it would be a great ice breaker to have each of you tell me how you spent your winter.

SNOW

You sound like my teacher, Maddy. She always starts the year off – “Fleas and ticks, how did you spend your summer?” Yuck.

MADDY

Okay, who would like to go first?

(Bugs point at each other.)

MONTY (flapping her wing)

All right, I will. I'm still tired from winter after my long flight from Albany, NY, to Mexico.

SOLDIER

You've got to be kidding. That's a couple of thousand miles. I just bore a hole in the bark of my favorite tree and take a long cool snooze.

SNOW

Cool. You want to hear about cool? My sisters and I love the cold. Like 20 degrees below zero cold.

TRANCH

What are you, crazy? You can't survive more than a few minutes being that cold.

SNOW

You've got to have built-in antifreeze like me to do that. I've got some antifreeze proteins right in here. (She points to her abdomen.)

These little molecules plus the way I'm built prevent ice from forming and freezing me up.

MADDY

It sounds like you've all got different ways of staying warm.

ANTSY

I like our way best. We like to snuggle, kind of like our relatives, the termites.

ALL

Groan. Ooo. Yuck.

ANTSY

You can say what you want, but we all huddle together underground. Down below the frost line. Way down.

TRANCH

If we did that, we'd be killing each other before the first week is out.

ANTSY

Oh, don't get me wrong. We don't all get along. Everybody wants to be in the center of the group where it's warmest, but the weaklings get pushed out to the edges.

MADDY

Sounds like a bunch of bullies to me.

GYPSY

We just take a long nap in the winter when we're still eggs that our momma laid. She called this time diapause. Everything just stops. We wake up in the spring when the hardwoods are ready to bloom. We're crawly caterpillars, ready to eat the leaves off trees.

ANTSY

What about you, Maddy? What do you do in winter?

MADDY

First of all, Maddy and winter don't get along. I stay around all year where it's warm. I love Florida and my cousins love Mexico.

ANTSY

Yeah, but what if it gets cold.

MADDY

Antsy, I love the moist warm outdoors, but when the thermometer drops, I'm outta there. Straight to someone's kitchen or bedroom. That's what I do.

(Pause. Bugs talk with each other.)

Continued on next page

Language Arts Connection

(The International Bug Society Convention, continued)

MADDY

I'd like to call the group back to order and thank you for sharing your winter lifestyles with us. Now it's time for our break. Our chef has prepared snacks for all of us — dead animals, dead plants, and other goodies. Oh, by the way. Stay away from the pitcher plants—THEY WILL EAT YOU!

ALL

Mmmm. Yum. Let's chow down!

The group gets really quiet as they eat.

END

Activities

1. Find the classification, the Latin name — genus and species — for each bug in the play.
2. Write another play that uses the same characters but deals with another aspect of their lives, such as where they live in the summer, what they like to eat, or how they protect themselves from predators.
3. Locate the area of the world where each bug in the play lives. Find the area on a world map and share it with others.



Madagascar Hissing Cockroach

Wikipedia

In Their Own Words

Bug Quotes from Famous People

After reading these quotes by famous people, choose one. Write in your own words what you think it means and explain why.



We hope that when insects take over the world, they will remember with gratitude how we took them along on all our picnics.

Bill Vaughn

I can surely fool a man. People are not as smart as bugs.

Charlotte
Charlotte's Web



*God in his wisdom made the fly
And then forgot to tell us why.*

Ogden Nash

Time flies like an arrow, fruit flies like a banana.

Groucho Marx



Activity

My Favorite Bug

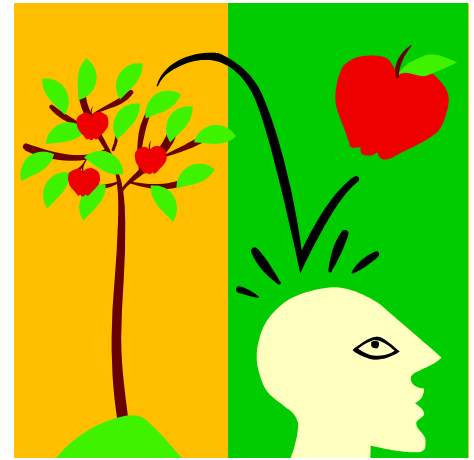
What is your favorite bug?

- Find your bug in a book or on an Internet site.
- On one page, draw or copy and paste a picture of your bug.
- List the class it belongs to and tell why it belongs there.
- Write an interesting fact about the bug.
- Add any other information you wish.
- Print and post your bug information on a bulletin board so others can learn about your favorite bug.



Drop It

A Word Game You Can Play Anywhere



Drop It First read the word clue. Guess the word. Read the Drop It clue. Guess the shorter word. Do both words make sense?

Example: A four-letter word meaning to get bigger. Drop it and it means something you do with an oar. Answer: **GROW**, **ROW**

Take turns finding the answers and then make up some of your own.

Word Clues	First Word	Drop It Clue	Shorter word
1. A six-letter word meaning moving through the air.		Drop it and it means being untruthful.	
2. A five-letter word meaning a group of students.		Drop it and it is another word for a young girl.	
3. A four-letter word meaning two of a kind.		Drop it and it is what you breathe.	
4. A five-letter word meaning to move something with a quick tap.		Drop it and it is something you do to a lollipop.	
5. A four-letter word meaning to force something out of your mouth.		Drop it and it is something in the middle of a peach.	
6. A four-letter word meaning what you see with.		Drop it and it is opposite of no.	
7. A six-letter word meaning the opposite of hotter.		Drop it and it is the opposite of younger.	
8. A four-letter word meaning a sudden attack.		Drop it and it means to give help.	
9. A five-letter word meaning little.		Drop it and it is a place where you go to shop.	
10. A four-letter word meaning several small rodents.		Drop it and it is something you put in soda.	

Answers on p. 27

Where Are the Bees?



Miel DeAbejas, Wikipedia Commons

The next time you bite into a sweet, juicy apple, thank a bee. Or, for that matter anytime you munch on almonds, carrots, broccoli, or melons, or gaze at a sunflower, thank a bee. Bees are the best **pollinators** of food crops throughout the world. That's about 15 billion dollars worth of food.

But there is a mystery in the bee hives. The adult bees, after leaving the hive to pollinate say a grove of orange tree blossoms, are not coming back to the nest. They are not found dead or sick. They just don't come back to the hive. This is happening all over the world. Called Colony Collapse Disorder, this mysterious disappearance of large numbers of the all-important honey bee is causing great losses in food production.

Scientists are looking all over to find reasons for this crisis. Some of the theories they are studying are tiny **mites** feeding on the bees, poor nutrition among adult bees, a poisonous **pesticide** on food plants, and stress of the large bee hives that are trucked from crop to crop throughout the growing seasons. They have even looked at, and ruled out, the effect that cell phones might have on the natural **homing systems** that bees use to find their way to and from their hive.

So far, no single cause has been found. Scientists are wondering if all these factors are coming together to cause the colony collapse.

Ponder

What would happen if there were no more bees?



Activities

1. Use your favorite search engine to find out more about the bee hive problem. Search "bee colony collapse disorder". List the reasons you find in this article for the collapse, then take notes on each of the causes you find in your search. Which do you think are the main causes of the collapse? Why?
2. Go to: <http://animals.howstuffworks.com/insects/bee.htm>. There are 11 topics about bees on this site. Pick one topic. Read about it and take notes. Find that topic on other sites and take more notes. Using your favorite way of expressing your ideas (writing, painting, web design, singing, dancing, etc.), share what you learned with others.



www.nsf.gov

Robobee

Future Bugs: Cyborgs and Robots

June 2021. You are standing near some flowers with your cousin.

“Hey Brinda, check out the bee,” you say.

“That’s not a bee, Jackson,” she responds. “It’s a robot — a robobee.”

Does this sound really far fetched? Well, it won’t be too far in the future when **cyborg bugs**, robotic bees, SensorFlies, and many more human-made bugs will be a part of our lives.

Scientists at DARPA, the Defense Advanced Research Projects Agency, the same government group that started the Internet, are developing “cybugs.” These are live insects that have human electronics placed in them at the pupa stage. For example, microscopic **sensors**, microphones or flight controllers are put into caterpillars. When they become butterflies, they can be directed in their flight by remote control to gather and send back information. When live animals have some electronic parts, as these cybugs would have, they are called cyborgs.

At the Harvard University School of Engineering and Applied Science, researchers are trying to create robotic insects that are all human-made. They model the robots after the real insects and try to have them **mimic** what the insects do. They are focusing on bees because the bee is able to fly from flower to flower and **hover** like a helicopter, even when it carries a lot of nectar.

As if making one bee would not be hard enough, they would like to create enough bees so that they could swarm in a colony and communicate with each other like real bees.

Professor Pei Zhang of Carnegie Mellon University’s Silicon Valley campus is working on a robotic SensorFly project. This robot is very lightweight like a fly, and it can quickly move from

one place to another. It can carry sensors for many thing such as video, audio, light and temperature. The SensorFly has wings that look more like those of a helicopter than a fly.

The SensorFly has many possible uses. It would be very helpful in flying into a building damaged by a hurricane or earthquake to see if there were survivors. It could also be used as a security system in houses or for finding the enemy in war.



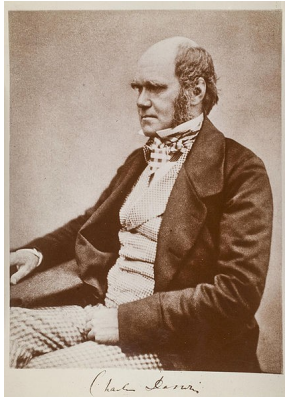
P. Zhang,
Carnegie Mellon University
Silicon Valley

Student Aveek Purohit flies a model of the SensorFly.

Although real bugs will always be a part of our lives, as time goes on, we will see more and more cyborgs and robots helping humans in ways we haven’t yet imagined.

Activities

1. Pick a real insect. Imagine a robot that mimics it. What would it look like? What would it do? How would it be used to help humans?
2. Cyborgs require humans to change insects. List some reasons why this is a good idea. List some reasons why this is not a good idea. Discuss the pros and cons of making cyborgs.



Wikipedia

Charles Darwin in 1854

Scientists Are People Too

Charles Darwin, Beetle Man

What would it be like to be Charles Darwin? Well, Darwin didn't like school much. He didn't want to study to become a doctor like his father and his grandfather. Actually, the sight of blood made him sick. He loved nature, the outdoors, hiking, and collecting beetles, birds' eggs, shells, stones and fossils. A freed slave, John Edmonstone, taught him the art of **taxidermy** (stuffing the skins of animals). This knowledge and his interest led to a job on the English ship HMS *Beagle* as a naturalist. He sailed around the world for five years. His life was changed and he changed the thinking of learned people the world over.

Science Expeditions

In the late 18th and early 19th centuries, British **naval power** was strong. England was carrying out expeditions in the name of science and exploration. Institutions and learning societies were sending scientists to explore, **catalog**, record and examine specimens all over the world. The British ship HMS *Beagle* was on a scientific mission circling the globe and exploring along the South American coastline and across the South Pacific. Darwin, age 22, was taken on as a

"gentleman passenger" to explore and record observations.

Darwin was an **avid** note taker. During the five-year *Beagle* voyage (1831 – 1836), his observations and drawings took up 15 field notebooks. He also kept three specimen notebooks for stuffed animals and dried plants, and four **geological specimen** notebooks for rocks and fossils. He continued making notes of his growing scientific interests in a series of notebooks. In 1840, he started taking notes on loose slips of paper which he kept in his growing subject portfolios.

Darwin's Theory

The material that he gathered on his journey became the source for his theory that life evolves by a process which Darwin called "natural selection." His scholarly presentation of 1859, *The Origin of Species*, is now considered a leading work in natural philosophy and in the history of mankind.

Darwin had a lifelong passion for collecting bugs. In winter, he would scrape moss off old trees into a large bag. He would then search through the moss for specimens. Darwin also found some rare species by collecting weeds from

the bottom of barges that brought reeds back to the ports. Here is a direct quote from his letter to a friend that shows his dedication:

A **Cychnus rostratus** once squirted into my eye & gave me extreme pain. I must tell you what happened to me on the banks of the Cam in my early **entomological** days. Under a piece of bark I found two **carabi** (I forget which) & caught one in each hand, when lo & behold I saw a sacred **Panagaeus crux major**. I could not bear to give up either of my Carabi, & to lose Panagaeus was out of the question. So that in despair, I gently seized one of the carabi between my teeth. To my unspeakable disgust & pain the little inconsiderate beast squirted his acid down my throat & I lost both Carabi & Panagaeus!

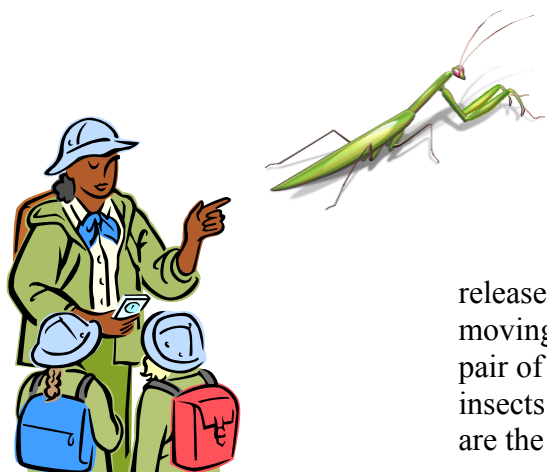
Trace Darwin's Journey on p.12.

Activity

1. Go to <http://www.aboutdarwin.com/darwin/WhoWas.html> to read more about Charles Darwin.
2. List the reasons why he became so interested in natural science.
3. Select one of the two beetles in the article. Draw a picture of it, and list some facts about it.

Humans and Bugs

So Alike, So Different



Humans and bugs are so different. We move on two legs, hear with ears, smell and taste with our nose and mouth, and use our single-lens eyes to see.

Moving

Some bugs move on six legs and others on eight. Centipedes and millipedes move on many more than that. Have you thought about how you might move your legs if you had six instead of two? Insects are called **hexapods** because they have six legs — three legs on one side and three on the other. To move forward, they move the front and back leg on one side, the right side for example, and they don't move the middle leg. On the left side, they don't move the front or back leg and move only the middle one. For the next step, they reverse it and move the front and back on the left and the middle leg on the right. Fortunately for the insects, they don't have to think about it,

just as we don't have to think about every step we take when we walk.

Insects have another way of getting around — wings. It takes a lot of energy for insects to fly. They store energy in their muscles and release it quickly to get their wings moving fast. Dragonflies use two pair of wings, while many other insects have just one pair. Insects are the only bugs that fly.

Eating

Humans have teeth in their mouths to chew their food. Bugs eat in various ways, but none of them have teeth as we know them. Some insects, like the grasshopper, have **mandibles** that look like tiny claws. These push the food into the grasshopper's mouth. Flies, mosquitoes and butterflies have a **proboscis**, a sharp, thin tube that can pierce the skin of its prey and suck up nutrients from it. We are familiar with the bite of a mosquito when we become its prey.

Seeing

Humans have two eyes with a single lens in each one. Many insects like flies and bees as well as their other arthropod cousins, crabs, have **compound** eyes. These eyes contain small units called **ommatidia**. Each unit takes its own picture and, just as in a human brain, the insect brain combines the images to make sense of them. In

some insects, there are over a thousand ommatidia in a pair of compound eyes.

Smelling and Tasting

When we smell and taste, we use our mouth and nose. In fact, we use them together. Try holding your nose and tasting something and you'll see how important smell is to human taste. Many bugs use other parts of their body to taste. Butterflies and flies have taste receptors on their feet, while honeybees and some wasps can actually taste with their antennae. Other arthropods have feelers on their mouths called **palps**. These feelers contain chemicals that allow them to taste and smell.

Hearing

In order to hear, we collect vibrations, or sounds, in our ears, and we change the sound waves into nerve impulses that travel to our brain. Many bugs use the same method, but they don't have ears, as we know them. Instead, they have **tympanal organs** that are like the head of a drum. Sound waves make the organs vibrate so the bugs can hear. Other bugs have special parts of their antennae that can sense sound vibrations.

Humans and bugs have many of the same body functions, but they don't have the same body organs. We are so different, but we end up needing the same functions to survive.

(Continued on next page)

Activities

1. Using the information in this article or other references, make a chart to show how humans and bugs are different. For example:

Part	Human	Bugs
Legs	Two legs	Insects – 6 Arachnids (spiders) – 8 Myriapods (centipedes) - many

2. Continue to compare humans and arthropods with one of these activities:

- Pick one body function like hearing or seeing. Do research using the Internet or a book to find more detailed information about this function. Do a written or visual report to show the difference between humans and arthropods.
- Choose one or more functions that were **not** in this article. Extend the chart in Activity 1 to show the differences between humans and bugs for these functions. Here are some examples: breathing, body protection, body structure (skeleton), digestion, and communicating (sending messages).

Avoiding Malaria Like a Mayan



D. Cochran

Ox Xio

Ox (first name pronounced och) is a descendant of the ancient Mayan civilization in Mexico. He has spent much of his life as an archeologist, digging in the Mayan ruins in Mexico, Belize, and Costa Rica.

Ox says that the Mayans used to avoid malaria, a disease carried by mosquitoes, by squeezing the oil from a scorpion and rubbing it on a mosquito bite. Of course, you had to be very careful that the scorpion didn't give you another poisonous bite in the process.

Today we have much better solutions, so stay away from mosquitoes and scorpions!



Take Care of a Bee or Wasp Sting

Bee and wasp stings can hurt and for some people, they can be serious. Most people are just a little sore after a bee or wasp attacks, but some are allergic to insect stings and can have a serious reaction. This reaction is called **anaphylaxis**, and it can cause tongue and throat swelling, hives and other unpleasant things. People who are allergic usually carry a special pen to inject themselves to stop the reaction.

The good news is that most people don't have terrible reactions, and they can treat the sting with a few easy steps:

- Step 1: Take out the stinger with a pair of tweezers or your fingers. It's important to do this to get the poison out of your system.
- Step 2: Wash the area using soap and water or alcohol.
- Step 3: Put something cool on the area to draw out the heat. An ice pack, cool wash cloth or wet paper towel will work.
- Step 4: Put first aid cream on the sting to reduce the pain. You can also use a paste made of baking soda and water.

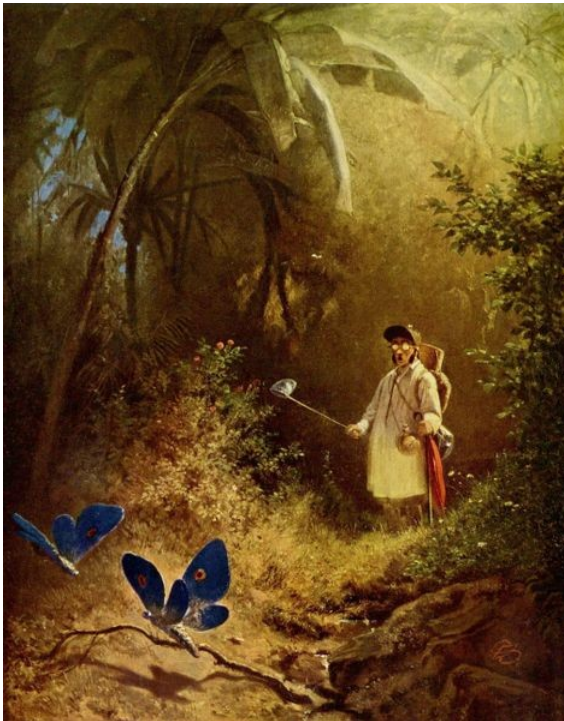
Bee and wasp stings are not any fun, so it's important to be prepared just in case you get stung.

BUG ART

The natural beauty of bugs has made them the focus of artists for thousands of years. The pictures on this page represent a small sample of the many ways that bug art brightens our lives.



Wikipedia Commons
Egyptian Marriage Scarab
in Brooklyn Museum



Wikipedia Commons
Painting—Der Schmetterlingsjäger
(The butterfly hunter) by Carl Spitzweg, 1840



Sigismund von Dobschütz, Wikipedia Commons
Insect sculpture in Donetsk, Ukraine



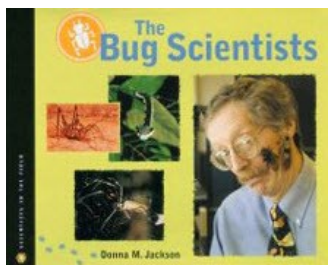
Josep Renalias, Wikipedia Commons
Grasshopper on a building sign on
Lombard Street, London, UK

Activities

1. Find examples in books or on the Internet of how insects are used in art. Why do you think they are such a popular part of artworks?
2. Choose your favorite bug and make an artwork based on it. Share your work with others and have your own bug art show.

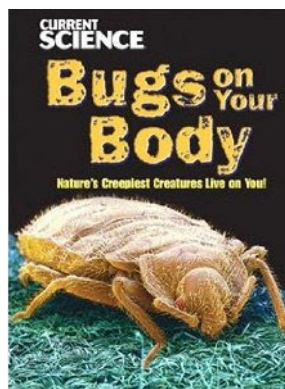
Bugs Book Reviews

Dr. Patricia Richwine



The Bug Scientists by Donna M. Jackson, 2002, Houghton Mifflin.

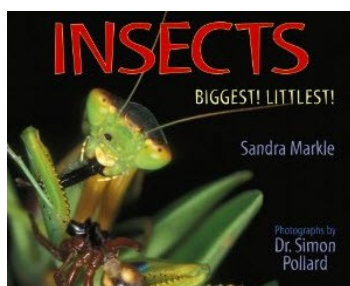
A professional bug scientist is an entomologist. Some entomologists in this book are as strange as the insects they study. Imagine going to the cricket-spitting contest at Purdue University created by Professor Tom Turpin. Some forensic entomologists like Valerie Cervenka work with the police to study insects at crime scenes. Entomologist Steven Kutcher directs insects in Hollywood movies like *James and the Giant Peach*. Find out how these and other people first became interested in bugs. Watch for the bug actors the next time you see a movie.



Bugs on Your Body: Nature's Creepiest Creatures Live on You! by John Perritano, 2010, Gareth Stevens Publishing.

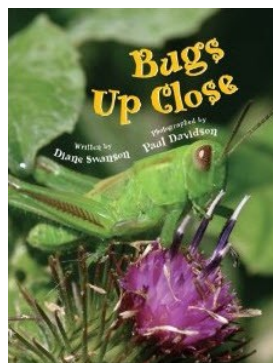
"Sleep tight and don't let the bedbugs bite." But they just might!

Bugs are everywhere on and around us. Mosquitoes, lice, fleas, ticks and dust mites may be attacking you and your pets. Some bugs spread major diseases that cause plagues. Discover ways that scientists are finding to battle bugs. This book will leave you *itching* to know more about the bugs on your body!



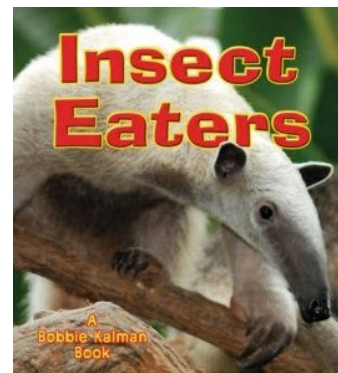
Insects: Biggest! Littlest! by Sandra Markle, 2009, Boyds Mills Press.

Stink or shield bugs are little but have a mighty smell to ward off predators. The giant stick insect, almost 2 feet long, is so big most predators can't fit it in their mouths. The pea aphid could fit on the head of a pin. The elephant weevil has a long, snout-shaped head to drill into plants for food. The Hercules beetle's big size helps when fighting for mates. Check the map to find out where in the world these biggest and littlest insects can be found.



Bugs Up Close by Diane Swanson, 2007, Kids Can Press.

When you see insects up close, you see that they have hard coverings called exoskeletons instead of skeletons like ours. Insects can molt or shed this outer covering. They have spiracles rather than lungs. The bigger-than-life photos in this book let you look right into the eyes of insects. You can examine the patterns on their wings. Inspect insect antennae and pincers. See the tiny leg hairs of bees as they hold pollen. Watch out for the wasp's stinger!



Insect Eaters by Bobbie Kalman, 2009, Crabtree Publishing.

What's for dinner? If you are an insect, it might be you! Insect eaters are called insectivores. Some plants, like the Venus flytrap, eat insects. Can you find other insect-eating plants? Spiders trap insects in their webs, while frogs use their long, sticky tongues to catch insects. What other animals use sticky tongues to do this?

Many birds are insectivores and use their sharp beaks to find and catch insects. Think about how woodpeckers get insects from under tree bark. Discover how you might be an insectivore, too.

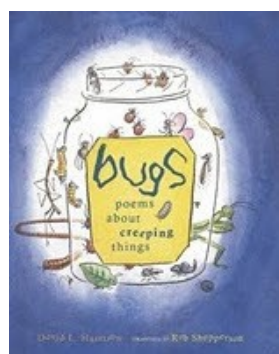
(Continued on next page)

(Book Reviews, continued)



Bugs That Build by Cari Jackson, 2009, Marshall Cavendish Benchmark.

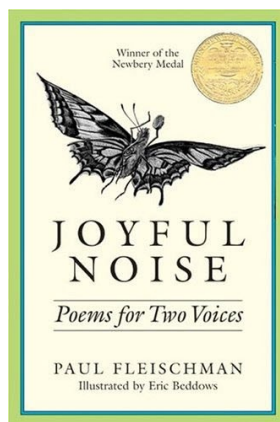
Did you ever make a tent? Tent caterpillars make their tents in trees. Do you have air conditioning in your house? So do termites. Air goes in and out through tiny holes in the walls of termite mounds. We learn about building by watching insects build. (See *biomimicry in the Design issue of Spigot*.) Honeybees teach us about building skyscrapers. NASA scientists are studying ants to build *swarms* of robots that will work together.



Bugs: Poems about Creeping Things by David L. Harrison, 2007, Boyds Mills Press.

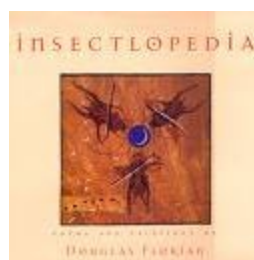
Beware; some of these poems are gross even for bugs like chocolate covered grasshoppers and dung beetles. It's fun to look for words that rhyme with different bugs. Like *chigger* rhymes with *bigger* and *flea* rhymes with *me*. Can you

think of rhymes for tick, gnat, bee and ant? Investigate a bug that's not in this poetry book and then write your own bug poem.



Joyful Noise: Poems for Two Voices by Paul Fleischman, 1988, Harper & Row.

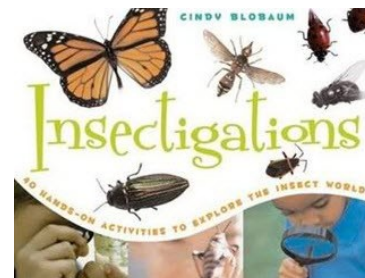
Do you have a friend who is interested in insects, too? Then, this is the perfect book for you. You and a friend can read aloud and even perform these insect poems for two voices. Your voices will sound like insects. You might want to find photographs of the insects to make a power point presentation to accompany your performance. See the review of *e.guides: Insects* for a site that will get you started.



Insectlopedia by Douglas Florian, 1998, Harcourt Brace.

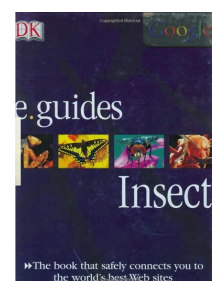
Look for concrete shape poems about the inchworm, whirligig beetles and termites. How many "tic" words can you find in *The Tick*? How would you illustrate the poems about walkingsticks or treehoppers? Try making

watercolor paintings on brown paper bags with collage like the author did for his illustrations. Or, just read these somewhat silly poems for fun!



Insectigations: 40 Hands-on Activities to Explore the Insect World by Cindy Blobaum, 2005, Chicago Review Press.

Items from your home can be used for these easy "insectigations." As you learn, read about real entomologists, record your own journal notes and discover some internet connections. Make a bug-friendly trap and a temporary terrarium to observe your insects. Have fun making and playing the "Insectigations" game. These activities may keep you "as busy as a bee." Try finding more "bug sayings" to illustrate and share with your friends.



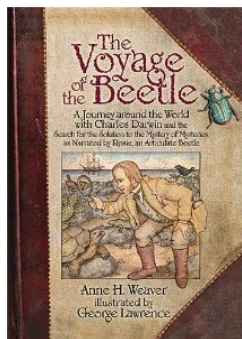
e.guides: Insects by David Burnie, 2005, DK Publishing.

What do bugs look like on the inside? Cool or gross? Can some insects skate and others swim? Do the swimmers also dive? Go beyond these questions with this book and the connected Web sites. Each page has its own keyword

(Continued on next page)

Library Connection

search connection. Read, research, download free images, watch videos and test your insect knowledge. There's even an Internet safety section for parents too. Check out www.insect.dke-guides.com



The Voyage of the Beetle: A Journey around the World with Charles Darwin and the Search for the Solution to the Mystery of Mysteries, as Narrated by Rosie, an Articulate Beetle by Anne H. Weaver, 2007, University of New Mexico Press.

What do the famous naturalist Charles Darwin and a beetle named Rosie have in common? They are both detectives. In this book, they spend five years on a round-the-world voyage to solve the “mystery of mysteries.” Read Darwin’s journal notes and observations and see how Rosie’s clues guide the exploration.

Use the timeline and world map to trace this fantastic journey. Figure out how many miles they traveled. Then go beyond this story by creating your own. You could pretend to be a lightning bug helping Ben Franklin discover electricity. Or perhaps pose as a firefly showing Thomas Edison how to make a light bulb. What mystery would you, as a bug, want to help solve?

Bug Talk Potpourri

What do you think these bug words, phrases and sentences mean?

bug juice

Stop bugging me!

bug out

Don't be a litterbug.

What's bugging you?

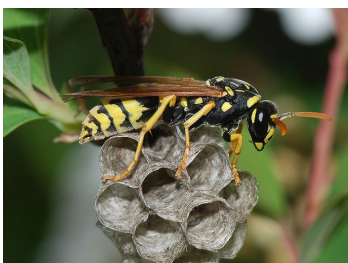
Put a bug in her ear.

bug off

Snug as a bug in a rug.

Sleep tight. Don't let the bed bugs bite.

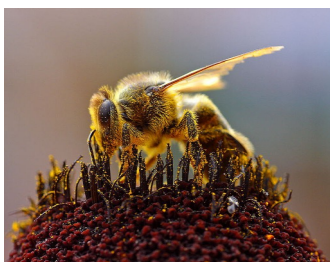
Answers to Bee or Wasp, page 8.



Alvesgaspar

Wikipedia Commons

A paper wasp queen starts a new colony.



Jon Sullivan

Wikipedia Commons

A honeybee takes pollen from a flower.



Wikipedia

German insect stamp

Answers to Bug or Insect, p. 4

Answers
beetle – insecta,
centipede –
myriapoda,
scorpion –
arachnida,
termite – insecta,
millipede –
myriapoda,
tick – arachnida,
butterfly – insecta.

Answers to Drop It, p.18

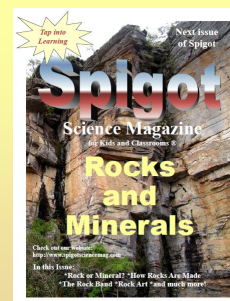
1. flying, lying
2. class, lass
3. pair, air
4. flick, lick
5. spit, pit
6. eyes, yes
7. colder, older
8. raid, aid
9. small, mall
10. mice, ice

Future Spigot Issues

Rocks and Minerals — Fall 2010

Sound — Winter 2011

The Brain — Spring 2011





*Tap into
Learning*

Next issue
of Spigot

Spigot

Science Magazine
for Kids and Classrooms ®

Rocks and Minerals

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<http://www.spigotsciencemag.com>

In this Issue:

*Rock or Mineral? *How Rocks Are Made
*The Rock Band *Rock Art *and much more!